Chapter 2

General Information

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Introduction

NHP–4 is a CDMA mode handportable Cellular phone product for the North American CDMA system.

NHP–4 offers digital mode full rate speech services defined in ANSI J–STD–008. The transceiver has a retractable antenna and a connector for accessories. The user communicates with the phone via LCD–display, keyboard and some audible tones.

NHP–4 can be connected to different accessories such as chargers, holders, hands–free units, data–adapters and handset through the bottom system connector.

Module Description

The transceiver electronics consist of the Radio Module (RF + Baseband blocks) and the UIF Module. The UIF Module is connected to the Radio Module with a 30 pin connector. BaseBand blocks and RF blocks are interconnected with PCB wiring. The Radio Module receives power from the Battery via a 4 pin connector located at the bottom of the PCB. The Transceiver is connected to accessories via a bottom system connector with charging and accessory control.

The Radio Module provides the MCU and DSP environments, Logic control IC (CDMA ASIC), memories, audio processing and RF control hardware (CDRFI). On board power supply circuitry delivers operating voltages for both BaseBand and UIF modules.

The UIF Module is a flex circuit with 4 blocks— keyboard, display, buzzer, and audio (earphone and microphone). The buzzer block contains a high current amplifer circuit to drive the buzzer. LEDs are provided for keyboard and LCD back lighting.

The RF block is designed for a hand portable phone, which operates in CDMA PCS systems. The purpose of the RF module is to receive and demodulate a radio frequency signal from the base station and to transmit a modulated RF signal to the base station. The RF parts are designed for power class II.

The system part provides MCU and DSP environments, memories, audio processing, and RF control hardware. On board power supply circuitry delivers operating voltage for both system and RF parts.

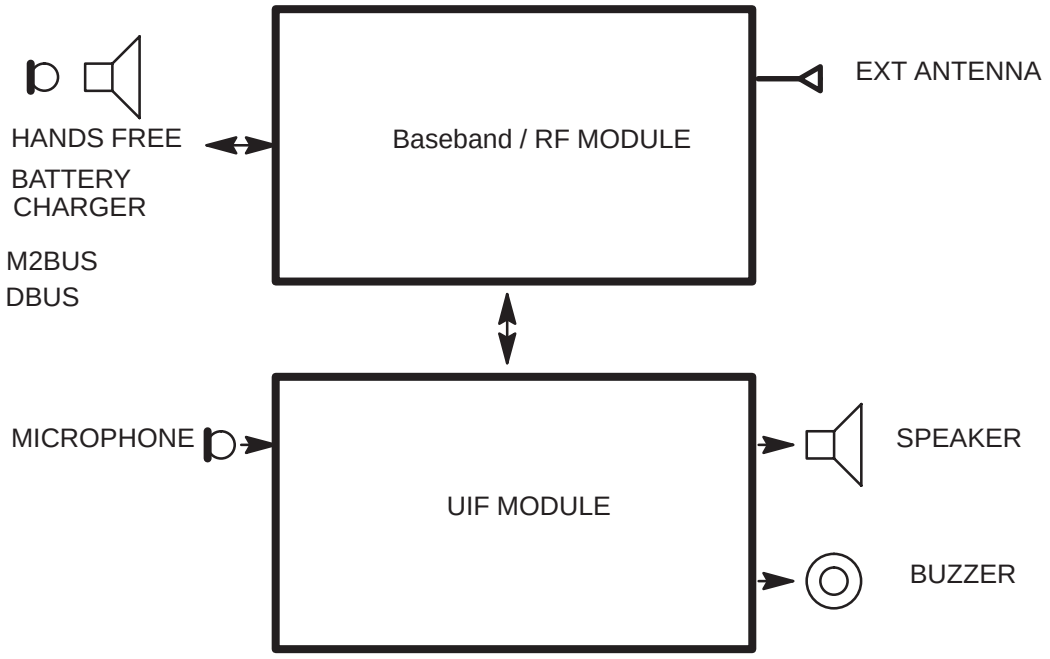

Figure 1. Module Layout

List of Modules

Table 1. Nokia1 NHP–4

Name of module	Type code	Material code	Notes
Transceiver CDMA	PCS1900	0501146	
User interface	DU8D	0200521	
System/RF	GR2	0200996	
Mechanics	MNHP4	0261xxx	Variable dependant on cover colour as listed

0261387 Woodgrain Nokia
0261789 Red Nokia
0261799 Blue Nokia
0261915 Woodgrain Primeco

Units and Accessories

Table 2. List of Battery Packs

Design	Type		Technology	Type Code	Material Code
Nokia1, CDMA	Slim,	600 mAh	NiMH	BBH –1S	0670027
Nokia1, CDMA	Std,	1100 mAh	NiCd	BBH–2H	0670030
Nokia1, CDMA	Ext,	1700 mAh	NiMH	BBH –1H	0670028
Nokia1, CDMA	Vibrator,	600 mAh	NiMH	BBT–1XV	0670119

Table 3. List of Chargers

Name	Type Code	Material Code	Notes
Fast Travel Charger	ACH–4U	0675012	USA model
Cigarette Lighter Charger	LCH–2	0675005	Universal
Desktop Charger	CHH–2	0675022	Universal
HF Desktop Charger	CHH–8	0675026	Universal
AC Adapter	ACS–6U	0680018	USA model, needed for CHH–8

Table 4. List of Mobile Installation Accessories

Name	Type Code	Material Code	Notes
Mobile Holder	MBH–6	0620009	
Mobile HF Charging Holder	MCH–8	0620010	
HF Junction Box	HFJ–3	0694009	
External HF Speaker	HFS–6	0692005	
HF Microphone	HFM–4	0690002	Original
HF Microphone	HFM–10	0690009	New , ”mouse” type
Power Cable	PCH–4	0730009	
External Audio Handset	HSU–1	0640047	
Compact HF	PHF–1	0700017	
Power Cable	LCP–2	0680022	
Mounting Plate	MKE–1	0650007	
Swivel Kit	HHS–1	0650006	3 screws
Swivel Kit	HHS–6	0650019	4 screws
Cable Holder	CKH–1	0620016	

Table 5. List of Data Accessories

Name	Type	Material code	Notes
PC–Link Adapter	DAU–2	0750029	
Data Cable	DKH–1	9780084	CHH–8 → PC Link
Data Cable	DKH–2	0730041	Adapter Cable
Data Cable	DKH–5	0730038	HP–PC Link

Table 6. List of General Accessories

Name	Type code	Material code	Notes
Carry Strap	SWH–1	0720005	
Belt Clip	BCH–2	0720022	
Headset	HFS–11	0690010	Over the head headset
Headset	HDC–2	0694017	Button headset

Basic Specifications

Table 7. Basic Specifications

Parameter	Notes
Cellular system	CDMA PCS
TX frequency band	1850.000 ... 1910 MHZ
RX frequency band	1930.000 ... 1990 MHZ
Duplex spacing	80 MHZ
Number of RF channels	1200
Channel spacing	50 kHz
Power Class	II
Maximum output power	+23 DBM 200 MW (CDMA)
Method of frequency synthesis	4 Synthesizerz and 1 multiplier
Frequency control	VCTCXO
Receiver type	1 IF
Modulator type	I/Q–baseband
Operational Voltage	5.3V...8.8 V

Technical Specifications

Modes of Operation

NHP–4 operates in two modes:

1. In digital mode it operates on digital sync, paging pilot and traffic channel.
2. Test mode (Local mode) used for troubleshooting and diagnostic testing.

DC Characteristics

Table 8. Supply Voltages and Current Consumption

Line Symbol	Minimum	Typical / Nominal	Maxi-mum	Unit / Notes
VBAT	5.3	6.0	8.8	V
VCHAR	11.0	12.0	13.5	V / chargers
VCHAR	730	800	870	mA / chargers
CURRENT CONS.	250	365	900	mA / in digital talk mode
CURRENT CONS	8	12	16	mA / dig. idle (Slotted mode) Slot cycle : 2.56s

AC Characteristics

Table 9. General RF Specifications

TX frequency band	1850.000 ... 1910 MHz
RX frequency band	1930.000 ... 1990 MHz
Duplex spacing	80 MHz
Number of RF channels	1200
Channel spacing	50 kHz
Spurious emissions In transit band at ant conn.	< –61 dBm (1MHz resolution bandwidth)
Spurious emissions In receive band at ant conn.	< –81 dBm (1 MHz resolution bandwidth)
Spurious emissions outside RX and TX band at ant conn.	< –47 dBm (30 kHz resolution bandwidth)

Digital Mode

Table 10. Transmitter Specifications for CDMA mode

Transmitter Type	One IF at 208.1 MHz, Linear
TX Channel Filtering	FIR in ASIC, 3dB BW from 1KHz to 615KHz
TX Spurious Filtering	4th order for D/A anti–aliasing, 2 ceramic RF filters and Duplex for receive band noise and spurious attenuation
TX Power Class	II
TX Power Amplifier type	HBT MMIC
Linear TX output power range	–50dBm to 23dBm minimum in a 1.23MHz BW
Maximum TX power control	Adaptive limiter so TX power is limited to 23 dBm
TX duty cycle	1/1, 1/2, 1/4, 1/8 variable rate with random slots. A slot is 1.25mS. Rate is controlled by voice activity
Adjacent channel power	–42dBc in a 30KHz BW for offsets > 1.25 MHz from center F
Spurious emissions out off transmit band	FCC rules
TX noise floor at minimum TX power	–54dBm/1.23MHz (TX gate on), –60dBm/1.23MHz (TX gate off)
TX noise floor at RX band with Max. output power	–173dBm/Hz at RX input port
TX power control method	Output_power (dBm) = –73dBm – Receive_power (dBm) + TX offset (dB). TX is slotted mode
TX power initial accuracy	+/–9dB within value as specified by TX control method
TX offset control method	From base station with one increments or decrement every 1.25mS (but only during active transmit slot)
TX offset control step size	1dB +/–0.5, and +/–20% over 10 steps in same direction
TX gain control range	85 dB IF + 15 dB RF
Modulator type	I/Q modulator, OQPSK format
I/Q Modulator phase error	+/–6 deg (+/– 4 deg for D/A and filter)
I/Q Modulator gain balance	+/–0.65dB (+/–0.35dB for D/A and filter)

Table 11 Receiver RF specification, CDMA mode

Characteristics	Symbol	Min	Typ	Max	Unit
RX frequency range		1930		1990	MHz
IF frequency			128.1		MHz
1st LO frequency		2059.35		2116.85	MHz
2nd LO frequency			128.1		MHz
Receiver IF bandwidth			1.2288		MHz
Input signal level		–104		–25	dBm
Input dynamic range		79			dB
Noise figure	NF			10	dB

Table 11 Receiver RF specification, CDMA mode (continued)

Characteristics	Symbol	Min	Typ	Max	Unit
Reference noise bandwidth (total receiver)			1.2288		MHz
Single tone desensitization, ±1.25MHz		–30 (Pin=–101)			dBm
Intermodulation spurious response level, ±1.25/2.05MHz		–43 (Pin=–101) –21 (Pin=–79)			dBm
Passband amplitude response 1 KHz 615 KHz 1250 KHz >1250 KHz		–77 –75		–3 –4	dB dB dB dB
Mean Square Passband phase response, 1–630 KHz (with base station phase equalizer)			0.03		rad^2
Receiver gain		12		91	dB
Receiver gain tolerance range. Without gain setting or A/D				±8 (±9 w/AtoD)	dB
AGC range includes RF gain step and cal		103 (105 w/AtoD)	110		dB
AGC accuracy (output level variation for inputs –104 to –25 dBm)		–.5		+.5	dB
Baseband output level (single–ended), RL>10KOhm			48		mVrms
Baseband output level variation over RX input level of –104 to –25 dBm		–0.5		0.5	dB
I/Q Amplitude imbalance		–0.75		0.75	dB
I/Q Phase imbalance		–7.5		+7.5	deg

Table 12 Reverse CDMA channel signals

Parameter	Value / Notes
Bandwidth Occupied	+/– 900 KHz –42 dBc In A Bandwidth Of 30 KHz
Spurious Emission in 1.23 MHz Band In Mobile Receive Band	–80 dBm

Convolutionally Encoded, Block Interleaved, Modulated By 64–Ary Orthogonal Modulation And Direct–Sequence Spread

Mechanical Characteristics

Metric Units

Table 13. Mechanical Characteristics in Metric Units

Unit	Dimensions (mm) (W x H x D)	Weight (g)	Volume (cm^3)	Notes
Transceiver with standard battery pack	56x148x25	238	179	Nokia 1
Transceiver with standard battery pack	56x148x25	241	179	US CDMA
Transceiver without battery pack	56x148x25	134	137	Nokia 1
Transceiver without battery pack	56x148x25	137	137	US CDMA
Radio module	143x50x7	48		Common
UIF module	141x50x4	22		
Mechanics		62 ... 67		depends on design version
Battery pack 600 mAh	56x101x8	104	42	NiMH, standard battery
Battery pack 1100 mAh	56x101x20	162	90	NiCd
Battery pack 1700 mAh	56x101x20	188	90	NiMH

English Units

Table 14. Mechanical Characteristics in English Units

Unit	Dimensions (in.) (W x H x D)	Weight (oz.)	Volume (in-$ches^3$)	Notes
Transceiver with standard battery pack	2.2x5.8x0.98	8.39	10.9	Nokia 1
Transceiver with standard battery pack	2.2x5.8x0.98	8.50	10.9	US CDMA
Transceiver without battery pack	2.2x5.8x0.98		8.36	Nokia 1
Transceiver without battery pack	2.2x5.8x0.98	4.83	8.36	US CDMA
Radio module	5.6x2.0x0.28	1.69		Common
UIF module	5.6x2.0x0.16	0.76		
Mechanics		2.19 ... 2.36		depends on design version
Battery pack 600 mAh	2.2x4.0x0.31	3.67	2.56	NiMH, standard battery

Table 14. Mechanical Characteristics in English Units (continued)

Unit	Dimensions (in.) (W x H x D)	Weight (oz.)	Volume (in-ches^3)	Notes
Battery pack 1100 mAh	2.2x4.0x0.31	5.71	5.49	NiCd
Battery pack 1700 mAh	2.2x4.0x0.31	6.63	5.49	NiMH
Battery pack vibra				NiMH

System Connector

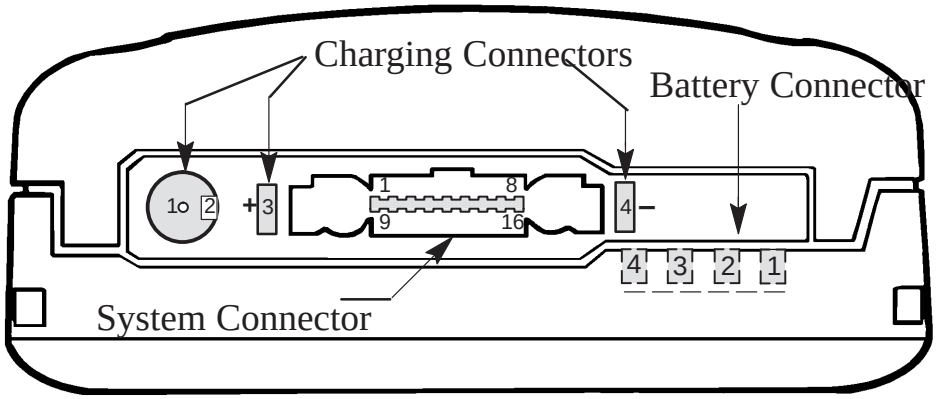

Figure 2. System Connectors

Table 15. List of Connectors

Connector Name	Notes
Battery	4 connector pins
Charging	Portable chargers: 3.8 mm DC plug and contacts for Desk Stand
System/Data	Centronix type, 16 pin, M2BUS, power supply and audio signals.
ANTENNA	
UIF	30 pin flex connector – (not shown in picture)

Table 16. System Connector

Pin / Conn	Line Sym-bol	Minimum	Typical / Nominal	Maximum	Unit / Notes	
1 / System	GND				Digital ground	
2 / System	XMIC JCON N		200 mV_{rms}	420 mV_{rms}		External audio input from accessories or handsfree microphone
3 / System	AGND				Analog ground	
4 / System	TDA	3.0 V	3.15 V	3.30 V	State ”1”	DBUS data to the accessories
		–.3 V	0.0 V	0.63 V	State ”0”	
5 / System	M2BUS	0 V	0.0 V	0.7 V	Input low level	Serial bidirectional data and control bus Isink < 5 mA, baud rate 9600 bits/s. Baud rate 19200 bits/s is in use in field test environment
		3.0V		4.9 V	Input high level	
		0 V	0.0 V	0.35V	Output low level	
		3.6V	4.65V	4.9 V	Output high level	
6 / System	HOOK/ RXD2	–.3V	0.0 V	0.63V	Hook on	HOOK indication
		2.5 V	3.15V	3.3 V	Hook off	
		–.3V	0.0 V	0.63V	Output low level	Flash data
		2.5 V	3.15V	3.30V	Output high level	
7 / System	PHFS/ TXD2	–.3V	0.0 V	0.63V	Output low, power off	Hands–free device power on/off
		2.5V	3.15V	3.30V	Output high, power on	
		–.3V	0.0 V	0.63V	Output low level	Flash data
		2.5V	3.15V	3.30V	Output high level	
8 / System	CHAR +	10.0V	12 V	13.5V		Battery charging voltage (unloaded)
		730 mA	800 mA	870 mA	Vin < 11 V	
9 / System	GND				Digital ground	
10 / System	XEAR/ HF–PWR		130 mV_{rms}	410 mV_{rms}	nom. DC–level 2.0V	External output to accessories or handsfree speaker and HF box power turn on/off
11 / System	DSYNC	2.5V	3.15V	3.30V	State ”1”	DBUS sync
		–.3V	0.0 V	0.63V	State ”0”	

Table 16. System Connector (continued)

Pin / Conn	Line Sym-bol	Minimum	Typical / Nominal	Maximum	Unit / Notes	
12 / System	RDA	2.5V	3.15V	3.30V	State ”1”	DBUS data from the accessories
		–.3V	0.0 V	0.63V	State ”0”	
13 / System	VAHS	2.5V	3.15V	3.30V	Headset voltage	
14 / System	VF	11.4 V	12.0V	12.6V	Programming voltage for flash	
15 / System	DCLK	2.5V	3.15V	3.30V	State ”1”	DBUS–clock
		–.3V	0.0 V	0.63V	State ”0”	
16 / System	CHAR +	10.0V	12 V	13.5V		Battery charging voltage
		730mA	800mA	870mA	Vin < 11 V	

Table 17. Battery Connector

Pin / Conn	Line Symbol	Mini-mum	Typi-cal / Nom	Maxi-mum	Unit / Notes	
1 / Battery	VBAT	4.0 V	6.0 V	8.6 V	Battery voltage for transceiver	
2 / Battery	BSI	136	160	184	600 mAh (NiMH)	Battery size indication. Direct A/D result 100 kΩ pull–up resistor in transceiver
		201	237	272	800 mAh (NiMH)	
		316	372	427	1200 mAh (Ni-Cad)	
		441	519	596	1700 mAh (NiMH)	
3 / Battery	BTEMP				Battery temperature indicator, voltage at 25 ^{o}C 22 kohm pull–up resistor in transceiver	
4 / Battery	GND				Power supply ground	

Table 17. Battery Connector

Pin / Conn	Line Symbol	Mini-mum	Typi-cal / Nom	Maxi-mum	Unit / Notes
1 / Char	VCHAR	11.0 V	12.0 V	13.5 V	3.8 mm DC jack for LCH–2 or ACH–4 No Load
2 / Char	GND				
3 / Char	VCHAR	11.0 V	12.0 V	13.5 V	Metal plates for charging in CHH–2
4 / Char	GND				

IMPORTANT: These inputs are not to be used as power input pins.

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